

WHAT IS CLAIMED IS:

1. A method of evaluating sound quality on image forming apparatus, comprising the steps of:

collecting a sound caused from image forming apparatus
5 at a location apart a certain distance from said image forming apparatus;

measuring a psychoacoustic parameter of the collected sound;

deriving a subjective evaluation value from the collected
10 sound through a subjective evaluation;

subjecting said measured psychoacoustic parameter and the subjective value to a multiple regression analysis;

computing a sound quality evaluative equation for assuming a subjective evaluation value, based on a result from the multiple
15 regression analysis, using said psychoacoustic parameter; and

computing a proper range of the subjective evaluation value assumed by the sound quality evaluative equation in said image forming apparatus.

20 2. An image forming apparatus characterized by a discomfort index, S , which satisfies $S < -0.5$, wherein the discomfort index S is calculated with the following sound quality evaluative equation (a), using a loudness value and a tonality value, both psychoacoustic parameters obtained from the sound from said image
25 forming apparatus at a location apart a certain distance from

an end of said image forming apparatus:

$$S = A \times (\text{Loudness value}) + B \times (\text{Tonality value}) + C$$

... (a)

5 where coefficients A, B and C are determined

$$0.247 \leq A \leq 0.380$$

$$2.075 \leq B \leq 4.890$$

$$-3.649 \leq C \leq -2.643$$

10 3. The image forming apparatus according to claim 2, wherein the coefficients are determined $A = 0.3135$, $B = +3.4824$ and $C = -3.1460$.

15 4. The image forming apparatus according to claim 2, wherein the psychoacoustic parameters, obtained from the sound from said image forming apparatus at a location apart a certain distance from an end of said image forming apparatus, satisfy conditions including a sharpness value ≤ 2.70 acum, a roughness value ≤ 1.24 asper and a fluctuation strength value ≤ 1.31 vacil.

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5. The image forming apparatus according to claim 2, at least comprising:

an image carrier for forming an image thereon; and

a charging unit which applies an AC bias to charge said

25 image carrier, wherein the AC bias has a frequency, f , which

satisfies $200 \text{ Hz} < f$.

6. The image forming apparatus according to claim 5, further comprising a charging sound reduction unit which reduces a charging sound caused during charging from said charging unit to said image carrier.

7. The image forming apparatus according to claim 6, wherein said charging sound reduction unit comprises a frequency shifter provided on said image carrier for shifting the eigenfrequency of said image carrier to a frequency different from a frequency obtained by multiplying the frequency f of the AC bias by a natural number.

8. The image forming apparatus according to claim 7, wherein said frequency shifter comprises a high-stiffness member for preventing said image carrier from vibrating, a sound absorber for absorbing a sound from said image carrier, or a damper for preventing said image carrier from vibrating.

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9. The image forming apparatus according to claim 2, at least comprising:

an image carrier for forming an image thereon; and

a charging unit which applies a voltage to charge said

image carrier, wherein said charging unit charges said image

carrier using a DC bias.

10. The image forming apparatus according to claim 2, at least comprising:

- 5 an image carrier for forming an image thereon; and
an image writing unit which writes an image on said image carrier using a polygon mirror and a motor for rotationally driving said mirror, said image writing unit including
a housing unit constructing a closed space for housing
10 said motor and said polygon mirror therein,
an opening formed in a portion of a side wall constructing said housing unit, and
a sound absorbent chamber provided outside said housing unit and in communication with the opening.

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11. The image forming apparatus according to claim 10, wherein said sound absorbent chamber has a resonant frequency resonating with a frequency of a motor sound depending on the number of revolutions of said motor.

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12. The image forming apparatus according to claim 10, wherein said sound absorbent chamber has a resonant frequency resonating with a frequency of a wind-hurtling sound caused from revolutions of said polygon mirror.

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13. The image forming apparatus according to claim 2, wherein the certain distance is determined as 1.00 ± 0.03 .

14. An image forming apparatus characterized by a discomfort index, S, which satisfies $S < -0.448$, wherein the discomfort index S is calculated with the following sound quality evaluative equation (e), using a sound pressure level (A characteristic) and, a sharpness value or a psychoacoustic parameter obtained from the sound from said image forming apparatus at a location
10 apart a certain distance from an end of said image forming apparatus:

$$S = A \times (\text{Sound pressure level}) + B \times (\text{Sharpness value}) + C$$

... (e)

15 where coefficients A, B and C are determined

$$0.066 \leq A \leq 0.120$$

$$0.342 \leq B \leq 0.709$$

$$-7.611 \leq C \leq -4.776$$

20 15. The image forming apparatus according to claim 14, wherein the coefficients are determined $A = 0.093$, $B = 0.525$ and $C = -6.194$.

16. The image forming apparatus according to claim 14, wherein the psychoacoustic parameters, obtained from the sound from said image forming apparatus at a location apart a certain distance from an end of said image forming apparatus, satisfy conditions including a loudness value ≤ 9.00 (sone), a tonality value ≤ 0.08 (tu), a roughness value ≤ 1.65 (asper), a relative approach ≤ 0.32 and an impulsiveness ≤ 0.48 (iu).

17. The image forming apparatus according to claim 14, at least comprising:

a paper conveying unit which conveys a recording paper, said paper conveying unit including

a guide member for guiding said recording paper, said guide member composed of a flexible sheet, said flexible sheet having a tip roundly folded for contacting with said recording paper.

18. The image forming apparatus according to claim 14, at least comprising:

a paper conveying unit which conveys a recording paper, said paper conveying unit including

a guide member for guiding said recording paper, said guide member composed of a flexible sheet, said flexible sheet having a contact portion bent at an end for contacting with said recording paper.

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19. The image forming apparatus according to claim 14, wherein the certain distance is determined as 1.00 ± 0.03 .

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